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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/679,799	10/06/2003	Susan W. Zogbi	090936.0532	3698

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EXAMINER	
TOWA, RENE T	

ART UNIT	PAPER NUMBER
3736	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/679,799	ZOGBI ET AL.	
	Examiner	Art Unit	
	Rene Towa	3736	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *06 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *10/06/03*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 1-24 are objected to because of the following informalities:

In regards to claim 1:

at line 1, remove "a" between "for" and "performing;"

at line 2, "the displacement" should apparently read --a displacement--.

In regards to claim 2:

at line 2, remove "the" between "resonating" and "each;"

further at line 2, "coil" should apparently read --sensor coil-- to avoid a potential indefiniteness problem.

In regards to claim 3, at line 1, "each rod" should apparently read --each magnetic rod-- to avoid a potential indefiniteness problem.

In regards to claim 12, at line 3, "one coil" should apparently read -- a sensor coil-- to avoid a potential indefiniteness problem.

In regards to claim 14:

at line 7, "a coil" should apparently read --a sensor coil-- to avoid a lack of antecedent basis problem (i.e. "the sensor coil", at lines 8-9);

at line 14, "the motion" should apparently read --a motion--.

In regards to claim 23:

at line 8, "a coil" should apparently read --a sensor coil-- to avoid a lack of antecedent basis problem (i.e. "the sensor coil", at lines 9-10);

at line 15, "the motion" should apparently read --a motion--;

further at line 15, the claim terminates without a period and may be incomplete.

In regards to claim 24, at line 2, "the spine" should apparently read --a spine--.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-3, 10-11, 14-16 and 21-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hansen (US Patent No. 4,618,822) in view of Young (US Patent No. 3,756,081).

In regard to claim 1, Hansen disclose(s) a system (20, 40) for a performing a remote measurement of the displacement between two adjacent objects (2,4), comprising:

a pair of sensors (10, 110; 10', 110'), each sensor (10, 110, 10', 110') having a magnetic rod 11 and a sensor coil 13;

wherein each sensor (10, 110, 10', 110') is operable to form a tuned circuit; and

an interrogator having a transmit coil (27, 27') and at least one receive coil (27, 41), transmit circuitry (21, 23; 21', 23') for delivering to the sensor coils 13 an excitation signal through a range of frequencies, and receive circuitry (31, 33; 31', 33') for receiving a response signal from the sensor coils 13;

wherein the interrogator is operable to detect a pair of peak frequencies from the sensors (10, 110; 10', 110') when the sensors (10, 110; 10', 110') are placed substantially parallel to each other in an environment where displacement is to be measured (see figs. 1-3; column 11/lines 26-44 & 55-64; column 12/lines 7-28, 36-39 & 41-50; column 15/lines 57-60).

In regard to claim 2, Hansen disclose(s) a system (20, 40) further comprising means (21, 21') for electrically resonating each coil 13 (see figs. 2-3).

In regard to claim 3, Hansen disclose(s) a system (20, 40) wherein each rod 11 has at least one end mount (17, 19) operable to be attached to one of the objects (2,4) (see fig. 1; column 11/lines 34-44).

In regard to claim 11, Hansen disclose(s) a system (20, 40) wherein the interrogator has digital processing circuitry (i.e. within microprocessor 25) for processing the received signal (see column 12/lines 7-11 & 36-39).

Hansen discloses a system, as described above, that teaches all the limitations of the claim except Hansen does not teach a system wherein the sensors have substantially the same resonant frequency or a mixer. However, Young discloses a system wherein the sensors have substantially the same resonant frequency and mixer 13 (see fig. 1; column 1/lines 7-32, 51-58 & 61-67; column 2/lines 3-8; column 3/lines 7-12). It would have been obvious to one of ordinary skill in the art at the time Applicant's invention was made to provide a system similar to that of Hansen with sensors similar to Young since such differential arrangement enables a measurement of twice the sensitivity to be obtained (see column 2/lines 67-68; column 3/lines 1-3).

In regard to claims 14 and 23, Hansen disclose(s) a method for determining displacement between two objects, comprising the steps of:

attaching a first sensor (10, 10') to a first location (i.e. skeletal object) 2;

attaching a second sensor to a second location (i.e. skeletal object) 4;

wherein each sensor (10, 110, 10', 110') has a rod 11, a coil 13, and a capacitor 15, electrically connected such that the rod 11, the sensor coil 13, and the capacitor 15 form a tuned circuit;

interrogating the sensors (10, 110, 10', 110') with an interrogation signal; and

receiving a response signal from the sensors (see figs. 1-3; column 11/lines 26-44 & 55-64; column 12/lines 7-28, 36-39 & 41-50; column 15/lines 57-60).

In regard to claim 15, Hansen disclose(s) a method wherein the sensors are attached by being embedded within a living body (see fig. 1; column 11/lines 26-33; column 15/lines 57-60).

In regard to claim 16, Hansen disclose(s) a method wherein each sensor is attached by means of an end mount (17, 19) at one end of each sensor 10 (see fig. 1).

In regards to claim 21, Hansen discloses method further comprising the step of creating an electrical resonance of each sensor, such that the response signal has a pair of resonant frequencies (see column 12/lines 47-50).

In regard to claim 22, Hansen disclose(s) a method wherein each sensor is self-resonating in response to the interrogation step (see column 11/lines 55-64; column 12/lines 28-36).

In regard to claim 24, Hansen disclose(s) a method wherein the skeletal objects are portions of the spine (see column 11/lines 26-33; column 15/lines 57-60).

Hansen discloses a method, as described above, that teaches all the limitations of the claims except Hansen does not teach a pair of sensors that are parallel or indicate the motion of the sensors relative to each other. However, Young discloses a method as follows:

In regard to claims 14 & 23, Young disclose(s) a method for determining displacement between two objects, comprising the steps of:

attaching a first sensor to a first location;

attaching a second sensor to a second location, such that the second sensor is substantially parallel to the first sensor;

wherein each sensor has a rod (9,10), a coil (7,8), and a capacitor (5, 6), electrically connected such that the rod (9,10), the sensor coil (7,8), and the capacitor (5,6) form a tuned circuit;

receiving a pair of peak frequencies that indicate the motion of the sensors relative to each other (see fig. 1; column 1/lines 7-32, 51-58 & 61-67; column 2/lines 3-8 & 67-68; column 3/lines 1-3 & 7-12).

In regard to claim 21, Young disclose(s) a method further comprising the step of creating an electrical resonance of each sensor, such that the response signal has a pair of resonant frequencies (see column 1/lines 15-32).

Since Young teaches that object displacement can be measured either with a single sensor or a pair of sensor arrangements (see column 3/lines 7-12), it would have

been obvious to one of ordinary skill in the art at the time Applicant's invention was made to provide a method similar to that of Hansen with a pair of sensors arranged similar to that of Young in order to differentially measure the displacement (i.e. relative to each sensor) (see Young, column 1/lines 22-32; column 3/lines 7-12).

4. Claims 7-9 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hansen ('822) in view of Young ('081) further in view of Bullara (US Patent No. 4,127,110).

Hansen as modified by Young discloses a system, as described above, that teaches all the limitations of the claim except Hansen as modified by Young does not explicitly teach sensors that are encased in a flexible sheath. However, Bullara discloses a system wherein the sensor is enclosed in a biocompatible flexible sheath 29 (see fig. 2; column 3/lines 41-44 & 48-56; column 4/lines 38-40; column 5/lines 21-31). It would have been obvious to one of ordinary skill in the art at the time Applicant's invention was made to provide a system similar to that of Hansen as modified by Young with biocompatible sensor encasings similar to that of Bullara in order to provide a housing structure that is not biologically reactive as it is well-known in the art. Moreover, it would have been obvious to one of ordinary skill in the art at the time Applicant's invention was made to provide a system similar to that of Hansen as modified by Young as further modified by Bullara with sensors made or coated with a biocompatible material since such a modification would serve the same function of providing sensors that are not biologically reactive.

5. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hansen ('822) in view of Young ('081) further in view of Aronow et al. (US Patent No. 3,628,381).

Hansen as modified by Young discloses a system, as described above, that teaches all the limitations of the claim except Hansen as modified by Young does not explicitly teach a mutual inductance bridge. However, Aronow et al. disclose a system comprising a mutual inductance bridge connected to a coil 11 (see fig. 1). It would have been obvious to one of ordinary skill in the art at the time Applicant's invention was made to provide a system similar to that of Hansen as modified by Young with an inductance bridge similar to that of Aronow et al. in order to compensate for the temperature deviations in the coil (see Aronow et al., column 3/lines 26-45).

6. Claims 4-6, 13, and 17-19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hansen ('822) in view of Young ('081) further in view of Shimizu et al. (US Patent No. 4,556,886).

In regards to claims 4-6 and 17-19, Hansen as modified by Young discloses a system, as described above, that teaches all the limitations of the claim except Hansen as modified by Young does not teach transmit and receive coils in a nulling geometry. However, Shimizu et al. teach several embodiment of at least one transmit coil (4A-B; 76-77) and at least one receive coil (5; 72-75) configured in a nulling geometry (see figs. 2, 14 & 17; column 2/lines 65-68; column 3/lines 1-15; column 4/lines 14-23 & 31-40; column 6/lines 13-16; column 10/lines 62-66; column 11/lines 29-37). It would have been obvious to one of ordinary skill in the art at the time Applicant's invention was

made to provide a system similar to that of Hansen as modified by Young with transmit and receive coil geometries similar to that of Shimizu et al. in order to obtain the displacement by measuring the phase difference between the transmit and receive coils (see Shimizu et al, column 4/lines 31-40).

In regards to claim 13, Hansen as modified by Young discloses a system, as described above, that teaches all the limitations of the claim except Hansen as modified by Young does not teach means for adjusting the resonance of the sensor. However, Shimizu et al. disclose a system comprising means 11 for adjusting the resonance of a sensor 1 (see fig. 7; column 7/lines 34-38 & 48-53). It would have been obvious to one of ordinary skill in the art at the time Applicant's invention was made to provide a system similar to that of Hansen as modified by Young with a means for adjusting the resonance of the sensor similar to that of Shimizu et al. in order to cancel the phase difference errors due to mounting (see Shimizu et al., column 7/lines 54-60).

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US Patent No. 3,827,291 to McCalvey discloses transducer systems for detection of relative displacement.

US Patent No. 6,447,448 to Ishikawa et al. discloses miniature implanted orthopedic sensors.

US Patent No. 5,291,782 to Taylor discloses an Eddy current position sensor.

US Patent No. 4,954,776 to Husher discloses linear displacement transducers utilizing voltage component in phase with current that varies linearly with core displacement.

US Patent No. 6,404,184 to Tabrizi discloses simplified low backlash LVDT coupling.

US Patent No. 4,906,924 to Zannis discloses linear variable displacement transducers including phase series connected coils.

US Patent No. 5,568,528 to Gaussa, Jr. et al. discloses a method and system for compensating a rod position indication system for non-linearity.

US Patent No. 4,638,670 to Moser discloses an apparatus for the determination of the distance traveled by a piston in a cylinder.

US Patent No. 4,112,365 to Larson et al. discloses a position detecting system.

US Patent No. 3,701,136 to Stevens et al. discloses system for detecting the position of a movable element.

US Patent No. 3,891,918 to Ellis discloses a linear displacement transducer utilizing an oscillator whose average period varies as a linear function of the displacement.

US Patent No. 4,284,961 to Landau discloses a digital position transducer including variable tuning element oscillator.

US Patent No. 5,111,139 to Rose discloses an inductive displacement transducer having an undulatory moveable member.

US Patent No. 5,107,211 to Rose discloses transducer for measuring rotary displacement of an object.

US Patent No. 4,030,085 to Ellis et al. discloses nonferromagnetic linear variable differential transformers.

US Patent No. 4,987,389 to Brosh et al. discloses a lockproof low level oscillator using digital components.

US Patent No. 3,253,588 to Vuilleumier et al. discloses a bio-instrumentation apparatus.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rene Towa whose telephone number is (571) 272-8758. The examiner can normally be reached on M-F, 8:00-16:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Max Hindenburg can be reached on (571) 272-4726. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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